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MARSHALL STAR

Serving the Marshall Space Flight Center Community April 13, 2006

Marshall matters: A conversation with the center director

How has Marshall changed since you became center director?

From my perspective, I think it's changed a fair amount. When I arrived at Marshall, we were thinking we were going to fly shuttle for a long time, implement Orbital Space Plane, and move forward with the Next Generation Launch Technology program. We were also getting nodes ready to fly on station, which are now complete and awaiting return to flight. That's all dramatically changed. We now have a new architecture with new programs we're going to implement. So, programmatically we've seen major changes, and our focus looks very different.

From a cultural perspective, I think we have a much more collaborative thinking process now than we had before. We have worked hard to define what our role should be for the agency. I think we've determined most of those roles and are beginning implementation in support of the agency's goals and objectives. I also believe we're able to think more strategically about what we are able to do for the agency, so we can pursue future work that will be fun and exciting for our people.

David Higginbotham/MSFC

Getting better at everything we do and working as a team are goals shared by David King.

What other changes do you envision in the coming year?

We have to continue to think strategically and find ways to help the agency implement its goals and objectives. Clearly, the agency is still defining what it's going to do over the next 10 years. Some things we're far along with, others, we're not quite that far. Some areas still have major changes occurring, such as science, and we're still working to understand how those changes will impact the role we'll play.

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Huntsville Center for Technology, Pittsburg State University rise to the challenge in Great Moonbuggy Race

By Bill Hubscher

It's not often one can soar with his or her feet on the ground, but that is exactly what students from the Huntsville Center for Technology High School and Pittsburg State University in Pittsburg, Kan., are doing after winning their respective divisions in NASA's 13th annual Great Moonbuggy Race in Huntsville.

"This is a great reward," said Jacob Lehman, Pittsburg State's team captain. "It's been a tough job, but worth every minute we put into this project. For us, the race was the reward. We just wanted to see if we could do it and if it would run. Coming in first is a fantastic bonus!"

The two winning teams were among 33 that raced their original moonbuggy designs across a half-mile simulated lunar surface at the U.S. Space & Rocket Center on April 7-8. The race is inspired by the original lunar rover engineers at the Marshall Center whose creation traveled across the moon during the last three Apollo missions in the early 1970s. The engineers had to design and build a compact, light, flexible and durable vehicle to carry astronauts on the lunar surface.

Students faced some of the same challenges while preparing to race their vehicles. The hands-on experience may inspire them to

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David Higginbotham/MSFC

Marshall Center Director David King discusses Marshall's mission.

I do believe, however, that we've made tremendous progress over the last couple of years in nailing down what it is NASA should do — at least our key missions. Now, we've got to understand how we're going to implement these missions. For instance, the agency is still determining what roles other centers are going to play and how to deal with research centers that aren't fully subscribed. We, as a center, are going to be spending a fair amount of our time trying to help the agency determine not only our roles in exploration and science, but also that of other centers.

The center still has a skill mix problem. What will it take to solve it?

We're working our way through that, and have teams in place doing a lot of assessment. Clearly, when you have a dramatic change in direction in the programs and projects you're going to be working on, it creates challenges for you. But, it also provides some opportunities. People will have the opportunity to do things over the coming years that they might not have done in the past. I see that as a positive thing — to allow people to expand and broaden and be challenged in different ways.

We have limited tools to manage the skill mix problem, so, we're limited in our approach. We are spending a lot of our time, as we have over the past year or two, identifying areas where we have excess or deficiencies, specific skills that are in excess, and determining if these skills can migrate to support current work the agency is doing. Then, we need to get them doing that work — either through reassignment or retraining. So, we're utilizing all the tools we have, but it's going to take some time and we all need to remain flexible. There is not going to be a perfect fit for everyone immediately.

Marshall has been assigned new work by NASA and has won new work through competition. So, is the center workforce fully subscribed?

We're not far enough through this process from an agency perspective to have everything defined to the point that we know everyone is fully subscribed. We're going through that process now and it's going to take some time. But, I think that will happen.

Parts of the center may be oversubscribed. We have a lot of work to do in certain areas and that's a great thing. But, there are areas where we do have some unfunded civil service in the future simply because we have not defined all the programs down to the nth level where we can understand how those people will bring value. Marshall has an unbelievable amount of capability, skills and talented people. I'm fully convinced we'll find ways for everyone to contribute, perhaps different than even those people envision.

Will we continue to seek new business?

Absolutely. I believe that any healthy organization has to be changing and evolving, doing new things and taking on new challenges. We have programs and projects we are finishing. For instance, we recently delivered the oxygen generator, and Gravity Probe B is winding down. As these things finish, we need new work for those people who are rolling off those programs.

People who have delivered hardware and had mission success should be the first that we try to engage because they've been successful with what they've done before. So, we've got to move them to existing work or find new work — new challenges — for those folks to take on.

We have a new business development office that is, I believe, fully functional now. This office has done a great job of identifying business areas we should pursue — and those we shouldn't pursue. Clearly, the best way to get new work is to do the work we have today extremely well. When you have successes, they are noticed. But this is a very complex business. We are involved in such a diversity of programs that we still have to continually be out there looking for new opportunities for our folks to contribute.

What do you see as the greatest challenge facing the center?

We have a lot of challenges. The greatest challenge I see is properly organizing and engaging our people so they all have compelling work. Helping people determine how they can best contribute through work they feel passionate about is extremely important. It makes people want to go the extra mile. That's what I believe will make us great.

And clearly, there are a lot of programmatic successes we need along the way. We've got to execute the programs and projects that we have extremely well. There are some huge challenges there. Flying shuttle again is a huge challenge. Getting through the requirements reviews and the next few milestones for the Crew Launch Vehicle is huge. Setting the stage for heavy lift and the future architecture is also critical. Also, determining what our future role in science is going to be and how that will play out is a current challenge for us.

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What is the greatest strength of the center?

I think the greatest strength of the center is our people. We have extraordinary people and I am more impressed every day with what they are able to accomplish. When I'm out in the community, I talk about the things we are accomplishing and I see the looks on peoples' faces and the awe they have for what we do as a center, and as an agency. We have great people who do very difficult and extraordinary things. We need to continue to invest in people and find ways to enable them to do the best they can do every day.

What areas would you like the center to improve in?

We've got to get better at everything we do to accomplish as much as we can. That is my continual goal and the goal I would like everyone to adopt. It's not just about doing great engineering, great human resources, or great science. It's about doing all of it well and continually finding ways to improve. That's how you get engagement from everyone. And that's where the power comes from — from every individual out here trying to find a way to contribute and improve every day. We have to focus on bringing the technical rigor, the good programmatic decisions, and good human resources and financial talents and decisions to the table.

This will help ensure we have the right team on the field, we have good facilities management and we're efficiently giving people a great environment to work in. That we have picked the proper contract mechanisms for some of the programs and projects we're trying to implement — and I don't want to leave any one individual organization or person out because they're all very important to our success.

What can each employee do to help make Marshall successful in 2006?

Find their niche — something they can get passionate about — throw themselves into it to the best of their ability and find ways of getting better every day. We're all such different people, all wired differently with different life experiences. We have to find ways to use people's strengths. I believe that's what will make us most successful in this coming year.

How important is it for Marshall to perform work in house?

I think it's very important for us to perform work in house because it offers a training ground for our folks and provides additional motivation for people who love to do hands-on work. It can also give us all a keener sense of the intricacy of our work, particularly developing hardware. Everyone here could benefit from a greater understanding of the detailed work our contractors do every day as they work to develop this hardware. It's extremely important that we all participate in its development and have an appreciation for it as we try to implement these programs.

Are we prepared to perform work in house?

I think we're prepared in certain, specific areas, such as advanced manufacturing, but we need to broaden a bit and do more in-house work in some other specific areas that will help prepare us to implement programs in the future. We have some of the smartest people in the world with the greatest capabilities working here at Marshall that would enjoy the fun and challenge of it. We've got some things to learn, but I think we're pretty well prepared.

What do you see coming in that area?

It's not totally clear yet what we'll be doing there. We have some in-house options we're looking at now and plan to make some decisions within the next year.

What do you see the role of science at Marshall to be?

We have a number of world-class scientists in their field at Marshall which is demonstrated by four Rossi prize winners, plus many other accolades that have come our way. We have to continue to work to understand the goals of the Science Mission Directorate so we can pursue those goals, and continue to capture work that supports those goals. We have contributed in a big way to the agency in science in the past, and I think we'll continue to do that. But, science is not the predominance of our work. Clearly, space transportation, launch vehicles and spacecraft are our primary expertise areas and are the foundation of our work.

What do you consider to be the most important attributes of a good leader?

I think the number one attribute of a leader is perseverance — someone who continues to find ways of solving problems to get to a goal.

In a high-performing organization, you have to have people who don't lose sight of the overall objective and goal. You have to have people who are willing to set themselves aside and do the right thing for the program, as opposed to what they think is right.

You have to have people who believe in putting a great team in place and letting them do their job. You have to have people who understand the value of teamwork at every level in an organization. But, you also have to have people who are good managers and are technically competent at what they do.

I also find that attitude is extremely important, because if we don't have the right attitudes we're not open to different ways of thinking or different ways of solving a problem. Leaders have to bring the right amount of rigor and the right amount of creativity at the right time.

They must also have the proper judgment to do those things — to know when to stick to a particular solution versus looking for

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Moonbuggy

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pursue careers in math, science and engineering and could lead them to participate in NASA's vision of returning to the moon, reaching Mars and traveling to destinations beyond.

The Huntsville Center for Technology High School, Huntsville, Ala., finished ahead of 17 other teams Friday during the high school division races with a time of 4 minutes, 6 seconds. Erie High School of Erie, Kan., finished second, and Pana Senior High School of Pana, Ill., came in third.

In the college division races Saturday, the team from Pittsburg State University beat out 15 other colleges and universities from across the country and Puerto Rico with a time of 3 minutes, 49 seconds.

The University of Evansville team from Evansville, Ind., finished second in the collegiate division, followed by the teams from the University of Tennessee at Knoxville, and the University of Puerto Rico in Humacao, which tied for third.

"For all the teams that competed, the reward is in the journey that got them here," said Jim Ellis, manager of the Academic Affairs Office at the Marshall Center. "They learned about designing, engineering and construction — things that could make them the next explorers of our universe."

"We applaud the innovation and determination to succeed that characterized every entry in this year's moonbuggy race," said Art Stephenson, vice president, Space Exploration Systems, for race sponsor Northrop Grumman Corp. "We hope that our commitment to sponsor the competition for the next several years will inspire many more students to enter the race and experience the immense personal and educational rewards it has to offer."

The first-place teams in both divisions were awarded trophies depicting the original lunar rover vehicle. The Huntsville Center for Technology team members also won a free weekend at Space Camp, while the Pittsburg State University team won a free trip to a space shuttle launch at the Kennedy Space Center, Fla., and a cash award from Northrop Grumman Corp. of Los Angeles, Calif.

The second- and third-place teams in both divisions were presented plaques honoring their achievement, and members of all six winning teams received medallions.

The first Great Moonbuggy Race was run in 1994 to commemorate the 25th anniversary of the Apollo lunar landing. Eight college teams participated that first year. In 1996, the race was expanded to include high school teams. Many volunteers from both Marshall and the space industry ensured the success of the event. The Northrop Grumman Corp. sponsored this year's Great Moonbuggy Race.

Other contributors included the American Institute of Aeronautics and Astronautics; ATK Thiokol; CBS affiliate WHNT Channel 19 of Huntsville; Jacobs/Sverdrup; Morgan Research Corp.; Science Applications International Corp.; the Tennessee Valley Chapter of the System Safety Society Inc.; and the United Space Alliance, LLC.

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.

NASA/MSFC

The moonbuggy team from Pittsburg State University in Pittsburg, Kan., powers through the rocket park at the U.S. Space & Rocket Center on its way to a first-place finish at NASA's 13th annual Great Moonbuggy Race.

The team from the University of Evansville of Evansville, Ind., rumbles across a lunar-like obstacle on its way to second place.

The team from the University of Tennessee in Knoxville speeds through the sand obstacle. The team tied for third with the University of Puerto Rico in Humacao.

The team from the University of Puerto Rico in Humacao strains to push its way through one of the obstacles. It took a third-place tie with the University of Tennessee in Knoxville.

The team from the Huntsville Center for Technology, Huntsville, Ala., takes a corner at high speed and heads for home and victory in the high school division.

The team from Erie High School in Erie, Kan., speeds through the course to a second-place finish.

Pana Senior High School of Pana, Ill., rumbles across a simulated lunar surface to finish third.

Marshall Center observes 25th anniversary of STS-1

Astronauts John W. Young, left, and Robert L. Crippen

Marshall met propulsion challenges for first shuttle launch in '81

At 3 seconds after 6 a.m. CST on April 12, 1981, the mission designated STS–1 lifted off from Pad A of Kennedy Space Center's Launch Complex 39. "Now we can breathe," said Jack Lee, who served as deputy director of the Marshall Center in the 1980s and as director in the early 1990s.

Rising on a pillar of orange flame and white steam, the first space shuttle cleared its 348-foot-high launch tower in 6 seconds and reached Earth orbit in about 12 minutes. "It was a beautiful happening," Lee said. The solid rocket boosters and external tank had been shed prior to orbit.

In Huntsville, Ala., like in other places, Sunday morning usually includes time to enjoy the Sunday paper or prepare for church. But Sunday morning April 12, 1981, dawned different in Huntsville as well as all over the world. Dawn brought the launch of Columbia, America's first space shuttle — a goal that people at Marshall Space Flight Center, Huntsville, and at other NASA locations had dedicated themselves to for more than 10 years.

The space shuttle lifts off on its historic first flight from Kennedy Space Center, Fla., on April 12, 1981.

As liftoff approached, Marshall engineers monitored consoles in Huntsville while others from Huntsville participated at the launch site in Florida. Their job was to give the green light to the shuttle propulsion elements that Marshall engineers and contractors had spent a decade perfecting.

Dr. William R. Lucas, then director of the Marshall Center, referred to STS–1 as the start of "a new chapter in the continuing account of man's exploration and use of space." STS–1 was the first American-crewed space flight in nearly six years.

By 1970, NASA initiated space shuttle development activity. At first, Marshall was heavily involved in the program definition phase leading to the initial shuttle configuration. In addition, Marshall had a vital role in the development of the launch vehicle system having been chosen by NASA to two major integration working groups with personnel from Johnson Space Center in Houston. These were the ascent flight integration working group and the propulsion systems integration working group. When the final concept was selected, the Marshall Center was given the responsibility for the development of the advanced propulsion systems.

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Director's corner

STS-1 opened doors to numerous opportunities

April 12 marked the 25th anniversary of the first space shuttle launch, STS-1. The inaugural flight of NASA's first truly reusable launch vehicle kicked off an exciting era in human spaceflight — the transition and use of the most versatile vehicle ever built.

The flight of STS-1 opened the door to numerous opportunities and innovations, thanks to the pioneering spirit of commander John Young and pilot Bob Crippen.

David King

Their willing adventure, as the first astronauts to test-fly what has become an icon of American innovation, energized and inspired a workforce, our nation and the world. Additionally, thousands of you, civil servants and contractors, spent countless hours on the development, design, tests and then the first flight of the shuttle. Thousands more of us have spent our entire career working on the orbiter, the launch facilities and the propulsion elements. Hundreds of American astronauts have gotten their first experience in space by way of the space shuttle, as well as numerous international astronauts. It is an amazing program with an amazing and dedicated team.

The space shuttle, NASA's workhorse, has enabled America's space program to deploy and retrieve satellites; conduct microgravity research; construct and service the greatest engineering marvel (International Space Station); and release into orbit three of the world's greatest observatories (Hubble, Compton, and Chandra).

The 25th anniversary of STS-1 is more than a remembrance of that pivotal moment in the agency. It is a celebration of commitment and accomplishment.

David King
Director, Marshall Space Flight Center

Crippen, Young: Marshall STS-1 propulsion elements role was 'outstanding'

"Thousands of people made that first flight happen, and we should all be very proud," said STS-1 Pilot Robert Crippen regarding the first flight of the space shuttle in 1981.

Columbia launched the Space Shuttle Program 25 years ago and the two men who flew the mission have always been careful to give credit to the people on the ground that made the mission possible. For Crippen and STS-1 Commander John Young some of the strongest memories regarding the flight came after the mission.

"Man, that was one fantastic ride," later exclaimed Crippen. "Engineering data says that the space shuttle main engines, solid rocket motors, and external tank worked in an outstanding manner," John Young said later regarding the Marshall-provided propulsion elements. "We got a smooth push out of the launch stand," added Crippen.

Crippen said that first shuttle flight was probably the most exciting time of his life. "When I got nominated for the flight, and John Young accepted me, it was very exciting," he said.

"After the flight, when we went all over the country and talked to everybody — we made about 400 appearances in about three months — you could see a lot of good spirit coming back. It was a shot in the arm to the patriotic spirit and to the get-up-and-go spirit that's inherent in the people in this country."

For Crippen, one of the strongest memories of the mission also comes not from space, but from Earth.

"One thing that has stuck in my mind wasn't during the flight or even right after the flight. It was the travels that John and I made," the Navy captain said. "Everywhere we went, we felt the sense of pride the country had. People everywhere felt they were a real part in it, not just in this country, but abroad as well, from Europe to Australia. It was out there, from small towns to big cities. When you see people react to something like that, it gives you a very good feeling, a good feeling of satisfaction."

Young had flown three different spacecraft and walked on the moon on the next-to-last Apollo mission. But the beginning of the space shuttle era was surprisingly different. "We had parades in Apollo where nobody came except the people who were in the parade," he said. "But we had parades all over the country after STS-1 and there were all kinds of people there."

The biggest surprise for those aboard Columbia during its baptismal trip was that there were no surprises. "We prepared for so many disaster scripts in simulations where everything went wrong. And so little went wrong, in terms of start to finish, that that is probably the most memorable thing," Young explained. "The whole mission was just like we planned it. We didn't run into anything we didn't expect. We did lose some tiles on the Orbital Maneuvering System pod, but that was about all we could see on board."

"There were a lot of things that people could see when we got back and looked at the data. On ascent, it pitched up and solid rocket booster staging was about 10,000 feet high, and, on entry, we had a big side slip," Young said. "That's what we were supposed to be doing with the first mission, looking at those kinds of things. Fortunately, the control system was set so that you could do that kind of stuff and get away with it. It was very tolerant of not having to know the exact aerodynamics to fly properly."

Marshall space shuttle development chronology for STS-1

The following is a chronology of major events involving the Marshall Center that led to the launch of STS–1 on April 12, 1981:

Early 1970s- NASA initiates space shuttle development activities. Marshall becomes responsible for the shuttle's major propulsion elements: the space shuttle main engine, the solid rocket boosters and the external tank.

May 1975 - Assembly of the first space shuttle main engine is completed.

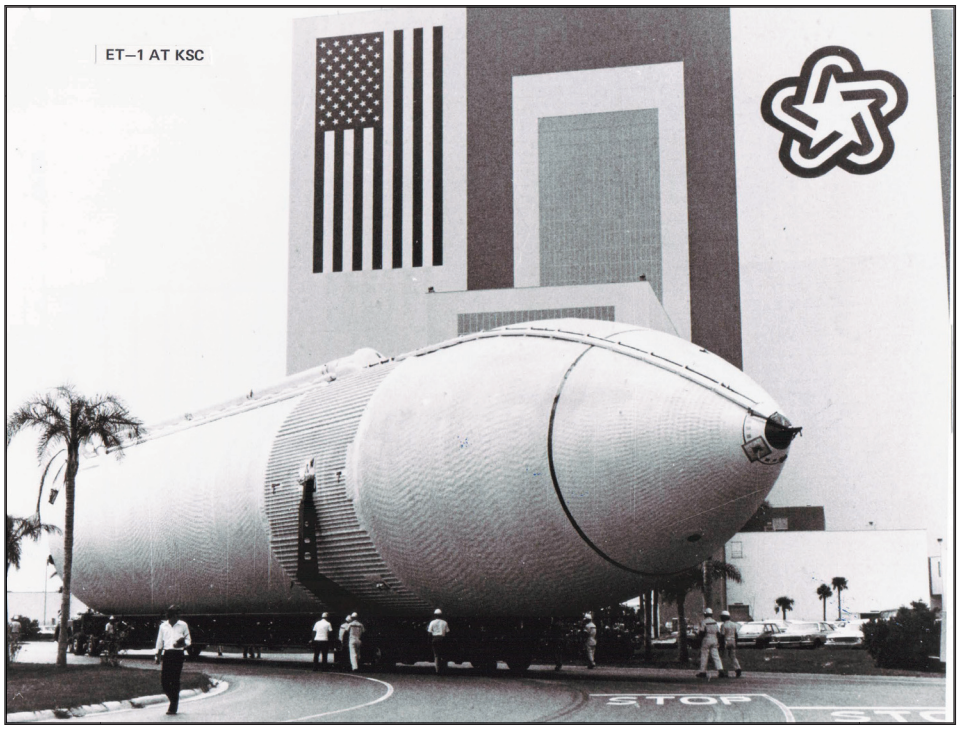
June 1975 - The first engine is used in the first ignition test at the National Space Technology Laboratory in Mississippi.

Late 1970s - Shuttle test activities are a major responsibility at Marshall, both in Huntsville and at the related NASA facilities in Louisiana and Mississippi. Marshall personnel participate in many development and qualification tests ultimately leading to the first shuttle launch.

March 14, 1979 - The orbiter Columbia arrives at the Kennedy Space Center in Florida.

June 13, 1979 - The first flight qualification static test firing of the space shuttle's solid rocket motors is conducted in order to verify safety factors built into the components.

July 1979 - The first flight external tank departs from Marshall's Michoud Assembly Facility by barge for Kennedy.



The External Tank Number 1 arrives at the Kennedy Space Center on July 3, 1979.

January 1980 - Assembly of the Space Shuttle "stack" is in progress. The twin solid rocket boosters are erected on a mobile launcher platform at Kennedy.

July 11, 1980 - The first Space Shuttle main engine for Columbia arrives at Kennedy.

November 1980 - Columbia's external tank is mated to its solid rocket boosters.

November 24, 1980 - Columbia is moved from the Orbiter Processing Facility to the adjacent Vehicle Assembly Building where it is mated with the external tank and solid rocket boosters to complete the space vehicle for STS-1.

December 29, 1980 - The assembled space shuttle on board its mobile launcher platform is moved the 3.5 miles from the Vehicle Assembly Building to Pad A to undergo final processing for launch.

January 1981 - Pad-flight vehicle interfaces are validated and a further series of tests leads to the wet, or fueled, countdown demonstration test for STS-1.

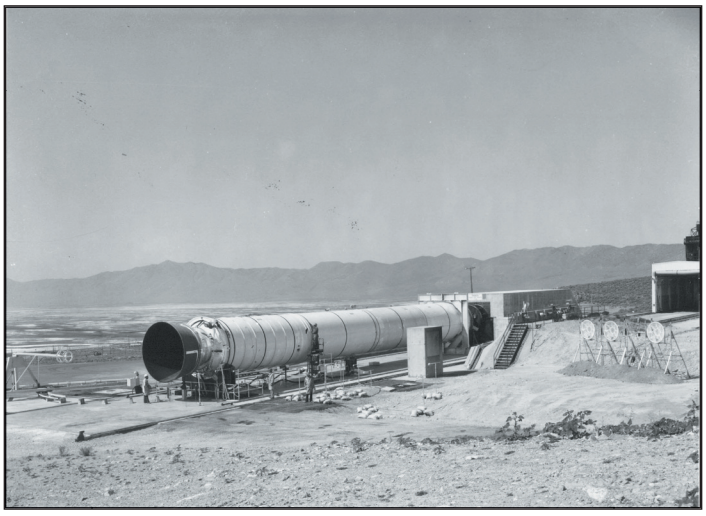
February 20, 1981 - A successful 20-second flight readiness firing is conducted on all three of Columbia's space shuttle main engines.

February 1981 - Steps are taken to repair a small portion of the external tank's super-light ablator insulation which became debonded during a tanking test of the orbiter's super-cold liquid oxygen and liquid hydrogen in January.

March 1981 - Launch readiness verification runs are conducted in which flight and landing events are simulated. NASA also conducts a "dry" countdown demonstration test as a rehearsal for launch.

April 10, 1981 - A computer problem delays Columbia's liftoff for 48 hours.

April 12, 1981 - Relying on the strength of its Marshall-provided propulsion elements, the Space Shuttle Columbia lifts off shortly after 6 a.m. Huntsville time.



Development motor-1 1977

1981

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Of the principal shuttle elements—the orbiter, main engines, external tank, and solid rocket boosters—all but the orbiter were developed under Marshall Center management.

Much of the shuttle effort at Marshall was performed by the same personnel and in the same facilities that had served the Saturn moon rocket program so well. As Saturn activity subsided, these resources were mustered for the space shuttle effort. Necessary administrative and physical changes occurred to accommodate the shuttle program, but in general the center continued its proven practices in the development of large propulsion systems.

The shuttle posed a number of technical challenges to Marshall engineers. Serving as both a passenger and cargo vehicle, the orbiter required highly efficient propulsion systems. How could that capability best be achieved? By integral engines? By external boosters? By a combination of both? How could enough fuel be provided for liftoff without burdening the orbiter with empty tanks in flight? How could fuel efficiency be improved to get the most energy from every gallon?

The shuttle had to meet a new requirement — reusability — and that introduced a host of new questions. What sort of rocket engine could withstand repeated use? How much of the propulsion system could be recycled and reused on successive flights? What materials could survive the rigors of repeated launches and reentries? For each of the propulsion elements, the Marshall Center developed unique solutions. The end product was a totally new launch vehicle.

When Space Shuttle Columbia lifted off on the morning of April 12, 1981, John Newton remembers "the toughest thing I ever had to do was stay seated in my chair at launch control" at Kennedy Space Center, Fla. "Just before launch, the launch director reminded us we were professionals — and we needed to remain calm and stay seated," recalls Newton, then the project representative for the External Tank Program at the Marshall Center.

"You could feel the electricity — the excitement in the air," remembers Newton. "As the shuttle lifted off, you could tell everyone wanted to jump up for a better look. I don't know how we stayed seated, but we did."

Vivid recollections of that early April morning in 1981 abound. Marshall Center engineer Jack Hengel was on the people-packed Cape Canaveral, Fla., causeway six miles away. "I remember seeing the plume generated by the solids — the solid rocket boosters — and then the shuttle just shot off the pad. I didn't expect such a rapid liftoff. I was used to watching the slow, lumbering liftoffs of the Saturn rockets," says Hengel, a former manager of the Solid Rocket Booster Recovery System.

"I remember one problem — on the main oxidizer valve — that took almost a year to solve," says George Hopson, a former manager for Marshall's Space Shuttle Main Engine Project. "Every time we tested the engine we took a chance at burning it up. It was the biggest obstacle we faced, and we knew we had to resolve it quickly to meet the first launch schedule."

The external tank was another design challenge. It had to be strong, light-weight, and hold more than a million pounds of propellant, and — because it would not be reusable — costs had to be kept down. Design of the solid rocket boosters was driven by the need for high thrust and reusability.

"Initial specifications called for motor case segments that could be used 20 times, but we wanted more," says Parker Counts, a former manager of Marshall's Solid Rocket Booster Project. Marshall engineers opted for a weld-free case formed by a continuous flow-forming process.

The Marshall Center also coordinated shuttle test activities. Test stands and equipment that had stood idle since the Saturn era were revived and remodeled to support shuttle test efforts. "Marshall met the challenge of developing durable space hardware that could be recycled for many missions," says Alex McCool who retired as manager of Marshall's Space Shuttle Projects Office.

In preparation for STS-1, space shuttle main engine undergoes a successful 520-second static firing test.

Bill Hicks reflects on how Office of the Chief Counsel aids Marshall to meet mission

By Jessica Wallace

During his 23 years at the Marshall Center, many as chief counsel, Bill Hicks witnessed many diverse legal matters. From counseling about human resource issues to assisting the center with patent prosecution, he and the staff of the Office of the Chief Counsel have provided continuous guidance to Marshall.

The main responsibilities of the Office of the Chief Counsel are to provide legal counsel to center management and programs; defend the center in lawsuits ranging from contract, environmental, patent and employee claims; provide procurement support; and perform dual reporting to the Marshall center director, center management and NASA general counsel.

"We're one of the leanest legal offices in the agency when you do per capita comparison, yet our staff provides outstanding timely and sound legal support," said Hicks.

During Hicks' tenure at Marshall, he encountered an array of positive adjustments and change in the legal office. "We have gone from a regulatory compliance review mode to a participating planning mode with the programs and projects. This office has become more customer-client focused, involved in more early planning and engaged in preventive law," said Hicks.

In the evolution of the space program, challenges come. The pending challenge, said Hicks, is managing the transition from the shuttle program to the Constellation Program. Handling the contractual issues that arise from the transformation, the legal office is working with center officials to support NASA's mission and the Vision for Space Exploration.

Hicks earned his undergraduate international affairs degree from Pennsylvania Military College in Chester in 1971. Three years later, he earned his juris doctorate from the University of Maryland School of Law in Baltimore. He came to Marshall in April 1983 as assistant chief counsel. The following year, Hicks was appointed deputy chief counsel. In 1996 he was promoted to chief counsel.

Ten years later on April 3, Hicks completed his service to Marshall. Deputy Chief Counsel Jim Frees is acting as Marshall's chief counsel.

"The privilege I've had managing the legal office can't be fully defined," Hicks said. "The competence of the team, the mutual respect and trust they have among clients and themselves, their solid professionalism — it is not enough to rightly describe their exceptional work ethics. Marshall has a fine legal staff defending the center. I am most proud."

And what does life after NASA hold for Hicks? Fly fishing, hiking with his son, spending time in a cabin in the mountains with his wife and playing with his granddaughter. "Maybe I'll do some consulting in the future, but right now, I'm truly retiring."

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.

David Higginbotham/MSFC

Bill Hicks and wife Maria during his retirement reception March 28.

King

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alternative solutions, when to persevere through something and when to say, "Okay, we need to think of a different way of solving this problem."

Next year, when you look back on 2006, what happenings would make you consider it a successful year?

On a programmatic level, I would like to have flown the shuttle a couple of times and begun to complete the International Space Station. I think that's essential for us because it provides the basis for us to implement the President's Vision.

It also provides a great transition base for us to get more resources over to the new work — in time — so we can hit our milestones on the Crew Launch Vehicle. We have some requirements reviews and other critical milestones this year that must be a success.

From an institutional perspective, we've got to finish the organizational alignment and get it exactly correct, get people engaged in the programs and projects we need them engaged in, and continue to build the team here so that we've got the right people in the right places to do all the great things we are attempting to do.

Marshall environmental office protects planetary, human health

Promotes better recycling, pollution prevention, land-use practices

By Jonathan Baggs

Space exploration and scientific research are part of NASA's primary missions, but agency leaders have emphasized that these goals cannot be pursued at the expense of the environment.

Marshall's Environmental Engineering and Occupational Health Office — part of the Office of Center Operations — helps Marshall comply with environmental regulations while maintaining its unique capabilities in space vehicle design and propulsion.

A true multifunctional organization, the environmental office provides technical support to NASA programs and ensures that employees follow federal and state regulations and executive orders for "greening the government."

The office promotes better land-use practices, recycling, pollution prevention, improved hazardous waste disposal and storage methods, and is responsible for monitoring air and water quality. It even is helping build a better next-generation spacecraft.

Marshall employees are responsible for adhering to four areas of environmental management at the center:

- Prevention — reducing future problems through an active pollution prevention program.
- Conservation — preserving our rich natural and cultural heritage for future generations.
- Compliance — bringing all operations into compliance with current environmental requirements.
- Restoration — cleaning up all problems resulting from past operations.

NASA Headquarters has designated Marshall's environmental office as the principal organization for helping determine how new Environmental Protection Agency Clean Air Act regulations, policies and requirements impact programs across the agency. Environmental issues are important to NASA because they impact how the agency does business. Non-compliance can result in project delays, fines, the temporary closing of a facility and unsafe working conditions. Working within the guidelines can result in savings of time and money, a thriving eco-system and healthier and more productive employees.

Courtesy photo

Benjamin Morrow, left, helps John Chorzempa and Marcus Garner perform a stream bio-assessment for water quality at the Marshall Center.

"Every day, the Environmental Engineering and Occupational Health Office bridges the gap between meeting the day-to-day demands of managing mission-critical environmental issues and realizing NASA's lofty vision of protecting the home planet," said Allen Elliott, manager of the Marshall environmental office. "We help enable the Marshall Center's mission by providing environmental compliance and stewardship and a safe and healthy workplace."

Marshall's environmental office supports new spacecraft design

Environmental issues are not something most people might associate with designing a new space exploration vehicle, but such issues help determine how the next-generation spacecraft to replace the space shuttle will be built.

From Elliott's fourth-floor window in Building 4200, there's a view of Marshall's Rocket Park displaying past space vehicles. Museum pieces to be sure, but it's a pretty good bet that none of them could be built with the same materials today because of environmental regulations. Some products used in the Space Shuttle Program have been banned from use because of Clean Air Act regulations.

That, said Sharon Scroggins, one of Marshall's lead environmental engineers, requires forward thinking when designing future spacecraft. "We try to ensure a sustainable design that uses products that will not become obsolete during the course of the program. Some of the challenges for future space vehicle designs stem from environmental requirements that preclude the continued use of certain traditional, well-documented materials used on past spacecraft."

Engineers designing next-generation spacecraft have to take these environmental requirements into consideration, since the new vehicles are intended to fly for many years into the future.

It's a delicate balance, Scroggins said. "Some materials currently acceptable for use could be rendered obsolete by future changes in environmental requirements. This potential for materials to become obsolete can affect the sustainability of new programs and their operations."

Elliott said documentation of future environmental impacts from next-generation spacecraft is being prepared in accordance

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with the National Environmental Policy Act. "We provide technical guidance and support to the Exploration Launch Office and the space shuttle program. Before a test stand or a facility for a new program can be built or modified, we have to identify any potential impact to the environment."

Prevention, compliance, restoration and conservation

Adhering to stringent pollution prevention and energy conservation initiatives often stimulates extensive re-evaluation processes. These re-evaluations can lead to improvements that save the agency money and time.

For instance, a wide range of chemicals are used at the Marshall Center to conduct maintenance, manufacturing and institutional tasks. Environmental regulations call for yearly reporting of chemical use.

Also, storing chemicals for such use presents safety and cost considerations. To decrease the amount of chemicals stored at the center, the environmental office re-evaluated Marshall's chemical management procedures.

Dan Adams, a lead environmental engineer working with pollution prevention and chemical inventory and reporting at Marshall, said the re-evaluation resulted in new procedures for ordering chemicals and using tracking software and barcode management. All chemicals now are purchased through one receiving point and each is tracked from that point through use-to-disposal.

"By re-evaluating this process, we reduced costs and risks associated with the amount of chemicals stored onsite and reduced the environmental, safety and health risks associated with chemical storage, handling and disposal. Now we have an improved process for tracking and reporting of chemicals, which means it takes less time to fulfill reporting requirements because fewer chemicals are stored on site."

This is just one of the many ways in which good environmental review and adherence to guidelines actually can save money, save time and make the workplace safer for employees.

Stewardship of a safe and healthy workplace

Elliott emphasized that it is the responsibility of all Marshall employees to understand how to reduce the environmental impact of work performed at the center.

Events such as the center's annual Earth Day not only help employees understand how to reduce their own environmental footprints, but also introduce them to the people who can help mitigate potential health hazards and provide information about environmental training classes. *(Earth Day events to be held Tuesday, April 18. See Inside Marshall for more details.)*

Training helps employees, individually and as a group, become aware of environmental stewardship issues at Marshall. Trained volunteers are useful in helping the environmental office conduct assessments of the various streams, wetlands and wildlife in the area. The environmental office also conducts archaeological surveys and inspects the numerous cemeteries located on Redstone Arsenal lands — remnants of when small farms and communities were located here before the 1940s.

The office conducts checks to ensure harmful substances are not leeching into water tables or streams. An example is chlorine. Although chlorine purifies drinking water for humans, it's toxic to fish.

"We want to drink chlorinated water because of its purified properties," Scroggins said, "but fish can't survive in it. So, we have to regulate where our chlorinated water goes."

The issue of planetary health, of balance between human and natural systems, is of particular relevance to NASA because of the agency's goal of understanding and protecting the home planet.

An Environmental Management System was put in place at Marshall in September 2005. All federal agencies were required to have a system in place by Dec. 31, 2005. It consists of a continual cycle of environmental policy, planning, implementation, checking and corrective actions and management review. This allows prediction of potential environmental problems early in a planning process, provides for the design of activities to minimize or avoid these problems, and allows for a continuous check or audit of environmental performance.

For more information on the Environmental Engineering and Occupational Health Office, go to http://co.msfc.nasa.gov/ad10/ .

The writer, an employee of ASRI, supports the Office of Strategic Analysis and Communications.

Courtesy photo

From left, Marshall team members Teddy Wilburn, Dan Adams and Nathan Coffee discuss possible uses for waste spray-on-foam-insulation that accumulates at the center.

Marshall develops faster approach to fluid flow meter design

Technology Transfer work results in large cost savings, 10 times more accurate than standard meters

By Lori Meggs

The Marshall Center's Technology Transfer Program Office has patented a faster way to determine flow rates of liquids through channels or pipes. Its balanced flow meter provides 10 times the accuracy of standard orifice-based fluid flow meters, resulting in significant cost savings to industries such as gas and oil refining.

"This technology can pay for itself in two weeks by reducing the amount of power needed to pump fluids through the meters and cutting the power costs to a company," said Anthony Kelley, a lead research engineer in the Integrated Systems Health Management and Sensors Branch of Marshall's Engineering Directorate.

This new approach to meter design improves on the older, standard orifice plates — meters that regulate how much and how fast fluids move through a channel or pipe — which are used extensively in refineries, chemical, power and pharmaceutical plants. While the standard plates have just one hole through which fluids flow, the balanced flow meter has multiple holes and requires less straight pipe to function.

Originally developed for NASA's Space Shuttle Program, the technology is already being applied in gas and oil refineries.

"This is another outstanding example of our work with a variety of industries to move aerospace technology to the public and private sector while supporting NASA's goal of improving life on Earth," said Sammy Nabors, commercialization lead in Marshall's Technology Transfer Program Office. Nabors predicts this technology will have a lasting positive impact in the gas and oil refinery industry.

The technology also has none of the moving parts that are in other metering systems, making it more reliable, less likely to malfunction and less expensive to manufacture. Other significant benefits include considerable noise reduction and its ability to be used in different systems without modifying the hardware. There are millions of standard orifice plate installations worldwide, and successful commercialization will result in replacement of those with balanced flow meter plates.

Licensed in August 2003, the technology was developed by NASA and A+Flowtek of Kingwood, Texas, a small, minority-owned business.

It was originally designed for use in space shuttle main engines, where the liquid oxygen flow meter enabled better system monitoring. Further development between NASA and A+Flowtek made this invention a viable, enabling technology in many commercial applications.

The balanced flow meter technology was conceived, created and tested through the Marshall Center's Technology Investment Program. The program, managed by the Engineering Programs and Systems Office, fosters the development of emerging in-house technologies.

The writer, an ASRI employee, supports the Office of Strategic Analysis and Communications.

Classified ads to return April 20

The Marshall Star classified ads will return in the April 20 issue.

NASA Web site features 25th anniversary of STS-1

Visit the NASA Web site for more information about the 25th anniversary of STS-1. Go to http://www.nasa.gov/mission_pages/shuttle/sts1/index.html .

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